WHAT IS CLAIMED IS:

1. A method of operating a magnetic resonance imaging system having a first coil and a second coil to achieve an imaging volume, said method comprising:

in a first mode, achieving the imaging volume by using a sum field from both of the coils; and

in a second mode, achieving the imaging volume by using a difference field from both of the coils.

2. A method in accordance with Claim 1 further comprising reversing the magnetic field from the second coil to change from the first mode to the second mode.

3. A method in accordance with Claim 1 wherein a field for the small imaging volume is B1, and a field for the large imaging volume is B2, the field from the first coil is denoted as C1 and the field from the second coil is denoted as C2, said method comprising selecting C1 and C2 such that C1 + C2 = B1, and C1 – C2 = B2.

4. A method in accordance with Claim 1 wherein P1 and S1 are primary and shield radii for the first coil, P2 and S2 are primary and shield radii for the second coil, and P1<P2<S1<S2, said method comprising achieving the current density for a small imaging volume coil by assuming that the primary and shield radii are P2 and S1 respectively and denoting the current density by D1.

5. A method in accordance with Claim 4 further comprising achieving the current density for a large imaging volume coil by assuming that the primary and shield radii are P2 and S2 respectively and denoting the current density by D2.

6. A method in accordance with Claim 5 further comprising denoting the initial current density for coil C1 by E1 = 0.5 * (D1 + D2).

7. A method in accordance with Claim 5 further comprising denoting the initial current density for coil C2 by E2 = 0.5 * (D1 – D2).

8. A method in accordance with Claim 1 further comprising switching between the first mode and the second mode.

9. A magnetic resonance imaging (MRI) system comprising:

at least one first coil; and

at least one second coil electromagnetically coupled to said first coil;

said imaging system configured to:

operate in a first mode to obtain an imaging volume by using a sum field from said first coil and said second coil; and

operate in a second mode to obtain an imaging volume by using a difference field from said first coil and said second coil.

10. A system in accordance with Claim 9 further comprising a switch configured to change a mode of operation of said system from the first mode to the second mode.

11. A system in accordance with Claim 10 wherein the switch is a circuit.

12. A system in accordance with Claim 9 wherein said system is further configured to reverse the magnetic field of the second coil in the second mode compared to the first mode.

13. A system in accordance with Claim 9 wherein a field for the small imaging volume is B1, and a field for the large imaging volume is B2, the field from said first coil is denoted as C1 and the field from said second coil is denoted as C2, and C1 and C2 are selected such that $C1 + C2 = B1$, and $C1 - C2 = B2$.

14. A system in accordance with Claim 9 wherein P1 and S1 are primary and shield radii for said first coil, P2 and S2 are primary and shield radii for said second coil, and $P1<P2<S1<S2$, the current density is achieved for a small

imaging volume coil by assuming that the primary and shield radii are P2 and S1 respectively and denoting the current density by D1.

15. A system in accordance with Claim 14 further comprising achieving the current density for a large imaging volume coil by assuming that the primary and shield radii are P2 and S2 respectively and denoting the current density by D2.

16. A system in accordance with Claim 15 further comprising denoting the initial current density for coil C1 by E1 = 0.5 * (D1 + D2).

17. A system in accordance with Claim 15 further comprising denoting the initial current density for coil C2 by E2 = 0.5 * (D1 – D2).

18. A method of imaging an object utilizing a magnetic resonance system, said method comprising:

imaging a first volume using a sum field from a first coil and a second coil; and

imaging a second volume using a difference field from the first coil and the second coil.

19. A method in accordance with Claim 18 further comprising reversing the magnetic field of the second coil to switch from the sum field to the difference field.

20. A method in accordance with Claim 18 wherein a field for the first imaged volume is B1, and a field for the second imaged volume is B2, the field from the first coil is denoted as C1 and the field from the second coil is denoted as C2, said method comprising selecting C1 and C2 such that C1 + C2 = B1, and C1 – C2 = B2.

21. A method in accordance with Claim 18 wherein P1 and S1 are primary and shield radii for the first coil, P2 and S2 are primary and shield radii for the second coil, and P1<P2<S1<S2, said method comprising achieving the current

density for the first imaged volume coil by assuming that the primary and shield radii are P2 and S1 respectively and denoting the current density by D1.

22. A method in accordance with Claim 21 further comprising achieving the current density for the second imaged volume coil by assuming that the primary and shield radii are P2 and S2 respectively and denoting the current density by D2.

23. A computer readable medium encoded with a program configured to instruct a computer to:

energize a first coil and a second coil in a first mode to obtain an imaging volume by using a sum field from the first coil and the second coil; and

energize the first coil and the second coil in a second mode to obtain an imaging volume by using a difference field from the first coil and the second coil.

24. A computer readable medium in accordance with Claim 23 wherein said program further configured to receive a mode indication from a user.

25. A computer configured to:

receive a mode indication including a small mode and a large mode;

energize a first coil and a second coil in a first mode to obtain an imaging volume by using a sum field from the first coil and the second coil when the indication is large mode; and

energize the first coil and the second coil in a second mode to obtain an imaging volume by using a difference field from the first coil and the second coil when the indication is small mode.